Columbus Railroad Company Power Station at the City Mills Dam, 1894
18th Street on the Chattahoochee River
Columbus
Muscogee County
Georgia

HAER GA-27

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
Heritage Conservation and Recreation Service
Department of the Interior
Washington, D. C. 20243

HISTORIC AMERICAN ENGINEERING RECORD

The Power Station of the Columbus Railroad Company

At the City Mills Dam

HAER GA-27

Location:	Columbus, Georgia, 18th Street on the Chattahoochee River.
Construction dates:	1894-1895
Original owner:	Columbus Railroad Company
Present owner:	City Mills Company
Significance:	This was the first central hydroelectric generating station in Columbus. From 1887-1906 it produced most of the electricity used for street, commercial and residential lighting, and for small power needs. It was a typical early low head development. The plant is interesting because of its early construction and the important service it provided. The equipment was dismantled in 1951, and shortly afterward the structure burned. The steel framework and iron roof remain; the six original turbines are visible through the burned-out wood floor.
Historians:	J. B. Karfunkle, Barbara A. Kimmelman, John S. Lupold, August 1977.

The City Mills station of the Columbus Railroad Company was the first hydroelectric generating station in Columbus. For a decade after its completion in 1895, it produced most of the electricity for the city's street, commercial and residential lighting, using hydroelectric technology typical of its day. The six Leffel Samson Turbines installed in the 1890s remain in place with some shafts and gearing, although all other equipment has been removed. The station was gutted by fire shortly after its dismantling in 1951.

The first section of this report deals with the development of central station hydroelectric generation at the site; its sub-sections treat in turn the power house construction, electric generation, electrical equipment, and the decline of the station's importance. Following this section are two explanded appendices, providing information on the distribution system served by the station, and a brief review of ownership of the site.

Construction of the Power House

Major W. M. Moses, L. G. Bowers, W. W. Genaid [of Savannah] and others received a charter for the Columbus Railroad on March 9, 1860. [1] They decided that a street railway in Columbus would not be a lucrative venture and the charter was not utilized. R. J. Moses investigated possibilities again in 1871 and even negotiated a contract with the city of Columbus in which the railroad would pay the city 10% of its profits for 30 years. [2] Still the endeavor did not seem profitable, although the need for a street railway was voiced in the newspaper. [3] No action was taken until 1883 when the Columbus Railroad Company organized under an act of incorporation. By April, 1884 the railroad commenced operations on 2 miles of track.

The initial operation consisted of 3 cars, each with a capacity of 14 passengers, pulled by a team of two mules. The railroad expanded and acquired additional cars which were pulled by donkey steam engines. By 1894 the railroad operated 4.4 miles of horse car tracks, 6.03 miles of steam-powered passenger "Dummy" belt lines and freight lines serving both the downtown business area and residential areas to the north and east. [4]

In 1892 the North Highland Railroad was operating an electric street car line parallel to a Columbus Railroad horse line. Also, early in the 1890s many considered that the "running of dummy [steam] engines in the streets [for traction] was dangerous, unsightly, and expensive," [5] and they were later banned by the city of Columbus. These factors, plus the observation that "After 1888 electric trolleys were adopted in cities throughout the country and they became one of the soundest and most glamorous investments during the 1890s," [6] prompted the directors of the Columbus Railroad Company to turn to electric traction. J. F. Flournoy, president of both the railroad and the Muscogee Real Estate Company, approached the City Mills Company about leasing water power rights at the City Mills dam to generate hydroelectric power for traction. [7]

City Mills and the Railroad signed an agreement on 9 November 1894. The Railroad was to pay $4000 per year for the privilege of constructing and maintaining a power station at the dam, and was required to develop at least 200 horsepower by 1 January 1897. Power developed after that date was considered "surplus" power, for which the Railroad would be charged $5 per horsepower per hear. The railroad was to use power from water which flowed "through 6 gates in two waterways west of the [City Mills] wheel house." City Mills had constructed a stone wall containing these waterways during 1891-1894 with the express purpose of providing additional water power. The dam at City Mills produced an appsoximate 9 foot effective head. The two companies shared 3,000 horsepower.

The powerhouse had to sit within a parallelogram which extended from the Northwest corner of the City Mills wheel house 125' along the stone wall built by City Mills, and a line extending from the western end or the wall 75 feet south. No building could be of wood. Access to the railroad power station was provided by an iron, single span, Warren deck truss brdige constructed at the same time which ran from the power house, behind the City Mills wheel house on to City Mills land (see CRR photo 1 and CMC photo 27). City Mills granted a right of way from the bridge to the street on which ran a rail spur linking the tracks of the Columbus and Western Railroads.

Columbus Railroad agreed not to sell power to any enterprise competing with City Mills in grinding corn or flour and City Mills allowed the railroad to use a supply of rock and rubble, blasted by the City Mills in earlier construction, to built the new powerhouse. The railroad was also to deepen the bottoms of the two eastern waterbays. The 50 year lease became effective 1 January 1895, and work on the power house began immediately. A coffer dam allowed construction to proceed and laterations to be made on the dam. [8] All alterations and construction are described below.

The power house was steel covered with sheet iron (CRR photos 2 and 3). The station measured 118 feet (east-west) by 47 feet and appended directly to the City Mills wheel house [see CMC photo 26 and Columbus Drawing 4 (City Mills site plan) to follow construction description]. The north outer wall of the power house also served as part of the bulkhead of the dam and was much higher than the rest of the dam (CRR photo 2). The positioning of the station allowed an unobstructed flow of water into the penstocks. Blasting was necessary to excavate the tailrace to minimize backwater interference with the turbines. This blasted rock was also used to build walls, foundations and dam extensions. All the rubble masonry rested on bedrock below the river. The rock bulkhead wall extended 235 feet west from the north-west end of the City Mills wheel house. Headgates were installed in its two water bays. Dam modification at this time included construction of a stone wall extending approximately 100 feet north, parallel with the current, replacing an older wooden section (CRR photo 3). The transverse section of the dam, still of wood, was altered to join the new wall.

Inside the power house, steel I-beams set into the rock masonry supported the floor which carried the generating equipment. Iron columsn supported the beams; each column weighed over 3 tons, and was bolted into the bedrock. [9] By April, 1895, four 68-inch single runner "Samson" turbines (James Leffel Company) were in operation. These were widely applied vertical type reaction wheel (CRR photo 4), each could develop 232 horsepower under a 10 foot head at 72 revolutions per minute. The four were arranged in on east-west row. All were geared to a main line shaft extending the length of the station (east-west), which ran at 200 revolutions per minute. The shaft was reported to be of hammered iron 6 inches in diameter. Heavy cast iron bridge trees bolted to the steel I-beams carried the shaft. A jaw coupling divided the shaft into 2 sections so that sets of wheels could be operated independently. In the initial phase of operations the shaft rotated 2 pulleys, each 84 inches in diameter, with a face 28 inches wide. Leather belts connected a General Electric multipolar 200 kilowatt 550-volt railway generator, raited at 425 revolutions per minute, to each of the two pulleys. [10]

Electric Generation at City Mills

The Columbus Railroad Company initially used its hydropower only for electric traction. The first producer of electricity for light and power at the City Mills station was the Brush Electric Light and Power Company. Organized on 12 May 1882, [11] the company initially secured the use of the Bruch arc light dynamo installed at the Muscogee Manufacturing Company. When the mill closed for the night the dynamo, driven by water wheels, powered arc lamps in stores in Columbus.

This venture was successful enough to allow expansion and the Brush Company soon built a steam plant to run the electric generating hardware. [12] This plant, located near 12th Street next to the Hamburger Mills, housed engines totalling 500 horsepower and boilers which burned cheap coal. The steam plant ran at full capacity until 1896 (see WPD photo 6). At this time the Brush Company leased part of the City Mills power house from the Columbus Railroad, and transferred the generating equipment from the steam plant to the hydropower station.

The railroad officers were eager to lend their turbines to the lighting business. Their experience "had shown that 2 of the water wheels [at the City Mills station] [were] ample for the purpose of running the railroad and that the 2 westerly wheels [were] unnecesary and useless to the Columbus Railroad for its business and that the surplus power and undeveloped water power were also unnecessary and useless to the railroad." [13]

The power house was divided into two parts at the jaw coupling on the main shaft between wheels #2 and #3 [wheel #1 was the eastern-most wheel]. The eastern 40 feet 9 inches of the house were maintained by the railroad, the western 30 feet 3 inches by the Brush Company. The Brush Company paid

Columbus Railroad $2,500 per year which the railroad applied to the $4,000 per year charge levied by City Mills Company for water power rights at their dam. Any surplus power which the Brush Company developed and used was to cost $5.25 per horsepower per year. [14]

The Brush Company belted its 3 Thomson-Houston 50-light arch dynamos, its 125-light Bruch arc dynamo, and its 2000-light, single phase laterators for incandescent lighting to the main shaft above wheels #3 and #4. The main shaft was uncoupled, separating wheels #1 and #2 from #3 and #4. [15]

As demand for electricity increased due to railway extension and increased subscription for light and power, it was necessary to increase the capacity at the power house. The Railroad Company installed two additional 68 inch Sampson vertical turbines on the western end of the station (CRR photo 5). The work was done by the Drake and Stratton Company, a contracting firm in Philadelphia. By 1 March 1897 all six turbines which are presently visible at the site were in operation. [16] The pump for the Columbus Water Works was connected to the shaft over the two new turbines. Power developed by the new wheels cost $5 per horsepower per year; the sum was paid to the City Mills Company. [17]

In March 1898, the Columbus Railroad Company became actively engaged in the electric light and power business by purchasing the Brush Electric Light and Power Company and all its assets and equipment. The same month, Columbus Railroad bought its street car competitor, the North Highlands Railroad Company [18] and moved the steam power equipment of the North Highlands operation to its own car barn one block from City Mills, where it provided auxiliary power for the railroad. The equipment included an 80 kilowatt traction generator capable of powering three street cars, each carrying two 15 horsepower motors.

The newly acquired steam plant (see WPD photo 6) was "old" in 1901. [19], but was needed nonetheless when the river was in its high and low water stages. The railroad needed to run three water wheels during high water [when effective head is reduced] if the steam plant was not fired up. When the steam plant was operating in conjunction with 2 water wheels it carried a load of 4 street cars each equipped with two 30 horsepower motors. [20]

Because of unreliable river flow thepower developed at the City Mills station could not meet the requirements of the combined enterprises of the Brush Company and the railroad. In 1900 plans were made to tie into the transmission lines of the Columbus Power Company whose station at North Highlands was nearly complete. The hook-up was not then made. [21] The North Highlands dam foiled because of flooding late in December, 1901, and the Columbus Railroad with an increased power demand in an extended period of high water. The municipal street lighting system failed 3 nights and

were continually dim. The incandescent lights flickered more than usual and the street cars often ran at half speed because of low voltages on the line. [22]

The manager of the railroad, H. S. Reynolds, increased the capacity of the steam plant adding a new boiler and a 100 horsepower electric generator. This doubled the generating capacity which was independent of the fluctuations in river flow. [23]

Reconstruction at North Highlands dam [1.3 miles north of City Mills] caused critical water shortages at City Mills. [24] The Railroad Company experienced difficulties with the main shaft in the power station and had trouble regulating the speed of the turbines, which caused the armatures of the generators to "keep burning out." [25] George J. Baldwin, a Savannah entrepeneur who was then president of the railroad and lighting company, complained that the irregular service provided by the railroad company had prompted customers to invest in the installation of independent electrical plants [steam driven electric plants maintained by the mill or business]. [26] Disillusionment with the City Mills station on the part of its operators and customers had begun less than ten years after the plant commenced operation.

Electrical Equipment

By 1904 the City Mills station was developed and utilized to its fullest capacity. Much equipment had been added since the Brush Company and the railroad combined. The 6 inch main shaft now ran east-west above the entire row of 6 turbines. Wheel shafts were geared to the line shaft by hollow steel bevel gear pinions. The penstock which carried water to these turbines was divided into 3 compartments, each having 2 large head gates. The walls which divided the penstock into compartments also had connecting gates. [27]

The main shaft was now divided into 4 sections. Two of these sections belted to a 5/8-inch hammered iron countershaft 45 feet long. Two 26 inch wide leather belts on hollow steel pulleys, attached to the countershaft on either end, drove the draft at 300 revolutions per minute. Friction clutch couplings connected the 5 sections of the countershaft so that it was possible to power the shaft from either or both ends. This shaft drove the smaller, high speed generators: 3 old Thomson Houston 50-light arch dynamos; a 125-light Brush arc dynamo; and 3 General Electric 1100 volt, single phase, 125 cycle alternators for incandescent lighting. Two Westinghouse 2200 volt, 150 kilowatt, 2 phase, 60-cycle generators, acquired in 1901 were belted directly to the main shaft. These produced current for the power customers. Finally, the 2 General Electric street car traction generators were belted to the first two sections of the main shaft. [28]

There were switchboards on both ends of the station. The main switchboard gallery stood at the west end of the interior adn was 45 feet long. The switchboard for the 2 phase power circuits was located on the east side of

the station. The railroad switchboard was of "highly polished" white Itlaian marble and consisted of five 36 x 84 inch panels --4 for machine switches, instruments and meters, and a 'Barber' regulator system, 1 for the feeder switches. [29]

The Barber regulator system was used to keep the load on the railroad generator even: it was a system of rheostats and 8 solenoid magnets [relays]. The load fluctuated ±20 volts when all things were working correctly. All turbines were regulated by mechanical governors. [30]

The switchboard for the arc lighting system was an ordinary General Electric plug board of Tennessee marble. It had an 8 dynamo circuit capacity. The incandescent lighting switchboard had 3 generator panels 62 x 30 x 2 inches and 7 feeder panels 62 x 24 x 2 inches, all made of polished Vermont marble.

The switchboard of the two phase power system was white marble with polished brass trimming. It had 3 sections: 2 for machine switches and 1 for feeder switches and instruments. The machine panel equipment consisted of a voltmeter, 2 ammeters, one 4 pole plunger type of non-arcing switch, rheostats, and a pilot lamp. The Westinghouse feeder panel contained 1 switch, 2 Thomson recording wattmeters, and one ground detector.

Lightning arrestors were located behind the switchboard. Circuits passed through the walls of the station to a wire frame extending along the exterior of the station (Crr photo 2). Between the arrestor and the boards was a choke coil of 20 turns of #6 wire wound on a wooden form. The lightning arrestors for the incandescent system were the "improved type L" station arrestor; for the power system, a "new Type Wurt Short gap" arrestor; for the arc system, a General Electric standard "double type" arch arrestor. [31]

City Mills Station in Decline

Although the inside of the station was no doubt beautiful, it never gave satisfactory service. Difficulties with water flow, so damaging in 1901, continued. Reynolds complained in December of 1903 that the station "is so poorly laid out that we are always in fear of low water or high water. It is of but little account and our engineers are less." Reynolds entertained "no hope" for inexpensive and reliable power from the station without a storage dam north of the Columbus Power Company dam to regulate river flow. [32]

When the City Mills station was fully loaded "any little rise in the river [affected] materially the schedule of railroad cars" and caused lights to flicker and dim. [33] Baldwin, as head of both the Columbus Railroad and the Chattahoochee Falls Company, complained to Stone and Webster, the "general

managers" of both companies, that the unreliability of power from the City Mills station was "almost unbearable." He called power and streetcar service in 1904 "exceedingly bad." [34] All power developments on the river suffered from variations in the water flow but "being between the two dams, North Highlands and Eagle and Phoenix, we [Columbus Railroad Company] are decidedly getting the worst of it." [35]

The interdependence of the power interests on the river led to the merger of the Columbus Power Company, the Coweta Power Company, and the Chattahoochee Falls Company, to form a new Columbus Power Company in 1906. The Columbus Power Company and the Columbus Railroad were now under the same management. At the time, the power station and the lease with City Mills were transferred to the Columbus Power Company by the Columbus Railroad Company. The Power Company operated the plant and the Railroad continued its services with current purchased from the Power Company. [36]

The Power Company made extensive repairs to the City Mills station in 1907, but the water flow situation more than offset these improvements. By 1908 the manager of the Power Company reported to Baldwin, now president of the Power Company, that "the City Mills plant is in such bad state of repairs that it is quite doubtful we can use the extra [western] wheels." [37] In the years 1904-1908 the City Mills people had improved their dam, expecting the railroad to utilize and pay for the surplus power of those 2 extra wheels. [38] These diverging expectations of the site strained relations between lessor and lessee.

In 1908-1909 City Mills sued the Power Company and the Railroad to annul the contract of 1894. George A. Pearce of City Mills noted that although the new dam provided a great deal of potential surplus power, the Columbus Power Company rarely developed it. The Power Company held the rights to that power and would not allow City Mills to use it. Pearce accused the Power Company of playing "dog in the manger" with the surplus power. [39] Baldwin knew he had the legal right to use or not to use the surplus as he saw fit and wrote that Pearce's "only claim . . . is of a moral nature." [40] In 1909 an independent consulting engineer investigating the operations of the Columbus Railroad for the Georgia Railroad Commission concluded that the power output of hteCity Mills power station provided less than 1% of the Columbus Power Company output. He stated that the property "must be held under lease by the Power Company simply to eliminate any possible competition from this source." The Power Company interests were in fact simply sitting on the water power available at the City Mills dam from 1906-1910. During those years 98% of power used by the Railroad Company came from the North Highland development and was conducted through the switchboards at the City Mills station. [41]

The Power Company decided to build a steam plant north-east of City Mills in 1907. Pearce obstructed the plans by not allowing a pipe for a condensing water for the steam plant to be laid in City Mills property. Although the Power Company had riparian rights and could use the water from

the City Mills pond, they could not get it to the steam plant. Just to appease Pearce, the Power Company in April of 1907 repaired the station and added a 300 kilowatt generator. They began paying for surplus power for the next quarter. Pearce, apparently satisfied, granted the right of way for the pipe. The steam plant was in operation in June 1911 [42] using a 500 kilowatt motor-generator and a 250 kilowatt General Electric traction generator (CRR photo 6). In 1914 all generating equipment for the electric railway was transferred from the City Mills station to this steam plant. The Columbus Power Company continued to utilize the City Mills station to generate 800 kilowatts for various services. The two newer turbines drove two 300 kilowatt, 2 phase, 60 cycle 2,300 volt General Electric generators installed in 1911. The four older turbines turned the mainshaft and countersahft as before. Two 150 kilowatt, 2 phase, 600 revolutions per minute Westinghouse constant voltage generators of the revolving armature type were belted to the countershaft; and the two General Electric D.C. multipolar railway generators were belted to the mainshaft until they were moved in 1914. A Lombard type N. S. oil pressure governor regulated the speed of the mainshaft. [43]

The station was an insignificant power producer in the 17,850 kilowatt system of the Columbus Power Company after 1911. [44] In 1917 the company did another major overhaul of the power house. By 1924, however, the plant was considered obsolete; all its equipment was retired, and was partially replaced in order to render the station fit for limited use. The refurbished station produced 400 kilowatts until 1950. [45] The Georgia Power Company allowed the lease with City Mills to expire at the end of that year, and the equipment was dismantled in 1951. A fire later burned away parts of the station floor. Today the supporting steel I-beams, the 6 original turbines, the penstocks, gates, and columns are all visible (CRR photos 5 & 7). The openings in the forebay were concreted shut and the turbines were rendered inmobile with concrete. The wooden platforms over the wheel pits are still sturdy. Most of the iron sheeting covering the steel frame is gone --but the roof remains. The rusty skeleton of the old station idly deteriorates next to the operating relic that is City Mills (see CRR photo 1).

Conclusion

The Columbus Railroad Company power station at the City Mills dam was the first significant hydroelectric development on the Chattahoochee. The station combined features standard to other such sites of the period, and innovated to solve technological difficulties specific to the site. For example, the station's arrangement of the vertical wheels, driving the shafting which was belted to horizontal generators was "not uncommon in older water power stations." The use of vertical wheels allowed the level of the generating floor to be independent of the water level and this provided considerable security against flooding. [47]

Although direct connection of the generator to the wheel shaft was known to be the most efficient means of turning the generator, this was not practical at the City Mills station when it was built. Vertical turbines were more suited to the low 10-foot head available, but in 1895 only standard horizontal generators were manufactured. These could not be directly connected to vertical turbines, and"where vertical wheels are employed it is sometimes more desirable to drive some standard type of dynamo with a horizontal shaft by means of bevel gears than to design a special dynamo to mount directly on the vertical shaft." [48]

Technological suitability to the specific site was clearly not enough to make the new station successful. First, the actual nature of the site changed as a result of new dam construction up-river. Operation of the Columbus Power Company's North Highlands plant, and later larger developments,dramatically increased difficulties with erratic flow at City Mills. More important, the new developments represented competition for the City Mills station, but not on the same scale as at City Mills. The new developments were modern hydroelectric plants combining larger installations with construction of long distance transmission lines, allowing the station's to expand into markets beyond their immediate area, absorbing small stations and companies. The managers of the City Mills station sacrificed the potential power of the station to their plans for larger developments (the HAER report Water Power Development at the Falls of the Chattahoochee treats this in great detail).

The City Mills power station therefore suffered Keenly as a small local hydroelectric plant beginning operation just as advances in electric generation and transmission combined to make it obsolete. It did, however, in its early years, fill Columbus' local needs for electric traction, light and power an important service to the city during the late 1890s and early 1900s.

Appendix I.

Electrical Distribution System of the Columbus Railroad Company

All current for arc street lighting, incandescent street nad interior lighting, and small power needs of the City of Columbus was generated at the City Mills station from 1897-1902. Much of the power needs of Columbus were also met by electricity generated there and from 1907 through 1911 all current for such needs passed through the station's switchboard. In 1911 all generating equipment for arc, incandescent, and power service including switchboards were transferred to the new steam plant.

From 1897 to 1911 the railroad operated three arc lighting circuits for the streets of Columbus and two such circuits for commercial applications. The three street circuits supplied 120 lamps [1897] with 916 amperes. All arc street lamps were mounted on top of poles with a hood set on top of the lamp. [49]

In 1897 the station supplied current to 6500 incandescent lamps, to a large number of fan and sewing machine motors, and even to some cooking and heating elements. The Muscogee Manufacturing Company purchased power from the station until 1901. [50]

For distribution of electricity for incandescent lighting, Columbus was divided into 7 districts. A set of feeders ran through the center of each district, each feeder hadan average capacity of 800 16-candle power lights. The power regulator was such that 36 watt incandescent lamps averaged 500 hours of operation. [51] Contract billing was used initially; [52] it was phased out starting in 1902 by the Stone and Webster organization. [53] Residential billing was on the contract system at least until 1906. The charge for residential lighting depended upon capacity of the service, not upon the number of outlets in the home. Outside of each lighted home was a cut-out box on a pole. Two fuses in the box were rated to pass only a specific maximum load. If the residents burned more or larger lamps than they subscribed for the fuses would melt. The house would be dark until the company came to replace the fuses. This contract system was not unfaborable for the company. Meters put on houses under contract service showed that home owners consumed more power than they paid for in the winter, and less than they paid for in the summer; supposedly, it evened out. [54] Contract rates, phased out in most small central stations by the late 1890's, had the advantage of a steady year round income for the company and did not require expensive watt meters and transformers. [55]

The Brush Company, and later the Railroad, provided street arc lighting for $50 per lamp per year when in Savannah the same service cost $72 per lamp per year. In 1903, 159 lights were in operation at this rate. In 1906 the Railroad increased the rate to $60 per light per year. [56]

In 1911, in conjunction with the establishment of the new steam station, the old 9.6 amp Thomson-Houston arc lighting system for street lighting was

discarded. The Railroad Company installed four 50-light 4 ampere series Magnetite arc systems. In areas where street arc lighting did not already exist in 1903 the railroad planned to install 32-candle power incandescent street lights --the charge to the city was $22.50 per lamp per year. [57] Lines for street lights ran on more than 1200 poles of cypress, cedar or chestnut 30 to 50 feet tall standing 75 to 120 feet apart. [58]

The Railroad operated an extensive system of electric street railway lines, expanding from the 3 miles of track in 1895 to 15 miles in 1897 and to 24.33 miles by 1908. All cars in 1847 were 28 feet long and all but three rode on McGuire trucks having 33-inch wheels and 3 3/4 inch axles (CRR photo 8). Two General Electric 800 type motors on each car moved the vehicles. Each motor weighed 1,450 pounds and developed 50 horsepower at 9 miles per hour. By 1904, 19 cans were in operation, 8 closed and 11 open; 5 served as trailers (motorless cars). In 1909 the company maintained 38 cars, 13 closed, 18 open and 7 which were a combination. [59]

The track was 56-pound trail laid on standard cross ties. Joints were bolted with six bolts on each rail and were bonded with copper. Double tracks ran along Broadway, the main dowtown line, with single track branches on most side streets. Lines ran to the residential areas of North Highalnds, Bibb City, East Highlands, and Rose Hill. A belt line looped from Broadway through all these outlying areas. The railroad acquired lines in Phenix City and Girard after merging with the Phenix City Railroad Company in 1903. [60]

The railroad also operated freight lines which pulled cars to the doors of city merchants by means of two steam donkey engines. In 1901 some of the lines were leased to the Seabord Airline Railway. [61]

The Railroad invested in recreational facilities to enhance liesure hour use of its services by leasing two parks from the Muscogee Real Estate Company. At Wildwood Park the Railroad excavated a lake with bath and boat houses, and built a large pavilion for dancing and otherentertainment. The Columbus High School now stands on this site. Lincoln Park, built for Columbus' black population, was located at the Rose Hill line terminus. [62]

After 1920, features of the street railway system in Columbus, stable for so long with modest expansion, changed quikcly. In 1924 all of the overhead wires for the street railway were placed underground. Only a line of ornamental poles remained in the center of Broadway. [63] In 1929 the East Highlands belt line was torn out, and in the early 1930s the electric railway ceased operations altogether.

Appendix II

Brief History of Ownership of the Site

The Columbus Railroad Company was incorporated by G. Gunby Jordan. H. G. Bussey, C. Phillips, L. A. Phillips, et al. In 1893 the company executed a mortgage to John F. Flournoy of the Muscogee Real Estate Company. He subsequently became president of the railroad.

The Brush Electric Light and Power Company was chartered in March, 1882 by J. Rhodes Browne, George P. Swift, W. Redy Brown, W. A. Swift, and G. M. Williams.

In 1894, in order to develop the City Mills site, the Columbus Railroad Company issued stock to raise capital. Drake and Stratton Company of Philadelphia bought most of this issue. Capital was also used to built a transfer station at 12th Street and Broad and to erect the car barn at 2nd Avenue and 18th Street.

George J. Baldwin of Savannah, an enterpreneur who managed electric power, light, and electric railway operations in Tampa, Houston, and Savannah, became interested in the Columbus Railroad in 1900. The railroad had been doing poorly --inall of its years of operation it had not even earned enough to pay its back interest. Receipts from the railroad did not increase after it was electrified. Baldwin offered Flournoy "the benefit of his force [Stone and Webster -his associates in Boston] to endeavor to place the Columbus Railroad on a paying basis." He added, "Owing principally to the lack of increase in population [in Columbus] and the low wages received by so large a portion of your citizens we can't promise to do as well in Columbus as elsewhere." [64]

In June, 1901 Bladwin and the Stone and Webster syndicate bought controlling interest in the Railroad Company; Stone and Webster became general maangers, Bladwin became the president. In 1903 the railroad was held by the Columbus Electric Company which was in turn held by Stone and Webster. In 1906, after the merger of the city's power interests, the new Columbus Power Company leased the station. Baldwin was president of this corporation and Stone and Webster were general managers.

The Columbus Railroad Company existed as a business entity held by the Columbus Electric Company until 1922 when the properties and assets of the Railroad Company and the Power Company were merged. On 31 May 1922 the Columbus Railroad Company became the Columbus Electric and Power Company. The assets of this company, including the City Mills station, were transferred to the Georgia Power Company on 30 January 1930. [65]

Footnotes

1. Charter of Columbus Railroad, filed March 9, 1866, Muscogee County Superior Court, Records of Writ. 1866.

2. Actions and Resolutions of the Railroad Commission of the State of Georgia, 1886-1887.

3. Columbus Daily-Enquirer 17 August 1881.

4. Minutes of the Columbus Railroad Company in storage at Georgia Power Company, Board of Directors Meeting 14 April 1895.

5. Muscogee County Superior Court, Records of Writ, City Mills Company vs Columbus Railroad Company 1909.

6. Michael Massouk, "Innovations in Street Railways Before Electric Traction: Johnson's Contribution," Technology and Culture 18 (April, 1977) 202-17.

7. Minutes of the Meeting of the Board of Directors of the City Mills Company, 18 September 1894, City Mills Company records, at City Mills Company, Columbus, Georgia.

8. Contract signed by City Mills Company and the Columbus Railroad 9 November 1894; City Mills Company records.

9. W. F. Borleau, "The Electrical Equipment of a Southern City," Electrical World [E. W.] 30 (4 September 1897) 275-278.

10. Ibid.

11. Muscogee County Superior Court, Records of Writ 1882.

12. Borleau, E. W. (4 September 1897).

13. H. S. Reynolds to G. J. Baldwin, 15 June 1896. George J. Baldwin Papers, Columbus files, Southern Historical Collection, University of North Carolina at Chapel Hill. All Baldwin correspondence below is from this collection unless otherwise indicated.

14. Reynolds to Baldwin, June-July 1896.

15. Ibid.

16. Report of George A. Pearce, president, 18 November 1897, City Mills Company Records.

17. Reynolds to Baldwin, memo, July 1901.

18. City Mills vs Columbus Railroad, Muscogee County Superior Court, Records of Writ 29 January 1898.

19. Reynolds to Baldwin, 27 July 1901.

20. John Flournoy to W. F. Borleau (copy in Baldwin papers) 20 July 1901.

21. Baldwin to J. F. Hanson, Bladwin to Reynolds, correspondence 1900-1901.

22. Reynolds to Baldwin, January-July 1901. The Columbus Power Company hoped to buy power from the City Mills station, but the Railroad Company could not adeuqately operate its own motor and lighting circuits. See also Hydro-Electric Power Development at North Highlands, HAER 1977.

23. Reynolds to Baldwin, January-July 1901.

24. Correspondence between J. F. Hanson, of Columbus Power Company and Baldwin, 1902.

25. Baldwin to Stone and Webster, July-August, 1902.

26. Baldwin to Reynolds, 26 February 1903.

27. "Plant of the Columbus Power Company, Columbus Georgia," Electrical World and Engineer (E. W. and E.) 43 January 1904, 165-168; correspondence, Reynolds to Baldwin, 1901-1904.

28. "Plant of the Columbus Power Company . . .," E. W. and E. 43 (January 1904).

29. Borleau, E. W. and E. 30 (4 September 1897).

30. Ibid.

31. Ibid.

32. Baldwin Papers, December 1903. Baldwin continually made plans for the building of such a dam at Clapp's Factory, but a regulatory dam was not built until 1910 at Goat Rock (see Water Power Development at the Falls of the Chattahoochee; HAER report 1977 for details.

33. Flournoy to Baldwin, 10 July 1901.

34. Baldwin to Stone and Webster, 14 December 1904.

35. Reynolds to Baldwin, 7 April 1902.

36. Baldwin's correspondence, 1906-1907.

37. Ibid, 1908.

38. City Mills Company records, 1904-1908.

39. Ibid, Board of Directors meeting, 21 October 1907.

40. Baldwin Paper, December 1908.

41. Way Report to the Georgia Railroad Commission concerning Columbus Power Company Rate Hearing, June, 1909.

42. Baldwin's correspondence, 1910-1911; minutes of Directors meeting, City Mills Co., 5 March 1907, City Mills Co. Records.

43. D. H. Braymer, "The Generating System of the Columbus Power Company, Columbus, Georgia," Electrical Engineering (formerly Southern Electrician) (June, 1913), 247-254.

44. Ibid.

45. Georgia Power Company records, Atlanta, Ga.

46. Edwin M. Clapp of Georgia Power Company to City Mills Company, 27 December 1950, City Mills Company Records.

47. Alton D. Adams, Electric Transmission of Water Power, (N.Y. 1906), 85.

48. Harold C. Passer, The Electrical Manufacturers 1875-1890, Cambridge, Mass., 1953, 177; Daniel W. Meade, Water Power Engineering, N. Y. 1920, 506, Adams, 89.

49. Borleau, E. W. 30 (4 September, 1897); Columbus Railroad Co. Records 1907-1911, Ga. Power Co., Atlanta, Ga.

50. Ibid.

51. Ibid.

52. Pamphlet in Baldwin's papers.
In 1897 the service of the Brush Electric Power and Light Company was summarized in a pamphlet of 1 August 1897. A few representative rates are given:

Contract Rates for arc lighting

1 light operating from dark til 8 p.m. 6 nights per week	$4.50/month
2 or more lights with same conditions	$4.00/lamp/month
1 light every night til midnight	$10.00/month

Meter Rates for arc lighting

12¢/KWH where an arc lamp consumes 450 watts/hour

Contract Rates for 16 candle power Incandescent Lamps

1 - 2 lights burning all night	$1.25/month/lamp
3 - 10 lights burning all night	$1.15/month/lamp
11 or more lights burning all night	$1.05/month/lamp

Meter Rates for Incandescent Light or Small Motor Operation

less than 25,000 watt hours	15¢/KWH
from 51,000 - 100,000 watt hours	14¢/KWH

Contract Residence Rates

3 light service	$2.00/month
5 light service	$3.33/month
10 light service	$5.55/month

Contract Ceiling Fan Rates

1 Ceiling fan	$5.55/month
2 Ceiling fan	$10.00/month
4 Ceiling fan	$17.50/month

Contract Rates for Power

1 HP	12 hour service	.$5.00/month
2 HP	12 hour service	$8.00/month
10 HP	12 hour service	$42.00/month
20 HP	12 hour service	$66.50/month

In 1908, after consolidation of the Columbus Railroad and Columbus Power Company interests, these rates were effective for power supplied by the railroad.

Metered Consumption

up to 50 KWH 12¢/KWH

Current was supplied to the following equipment from the City Mills station.

	1897	1898
Number of arc lights on line	222	233
Number of incandescent on line	7126	7886
Number of power motors on line	4	7
Number of fan motors on line	8	9
Horsepower of motors	46	311

53. To Reynolds from Stone and Webster, 1902 (copy in Bladwin file).

54. Borleau, E. W. 30 (4 September 1897).

55. Passer, 122.

56. Baldwin to Reynolds, 17 February 1903; Baldwin Columbus correspondence, 1906.

57. Baldwin Columbus correspondence, 1911.

58. Borleau, E. W. 30 (4 September 1897).

59. Actions and Resolutions of the Railroad Commission of the State of Georgia, 30 November 1909; Passer, 246, 266.

60. Borleau, E. W. 30 (4 September 1897); various maps of Columbus; Columbus Railroad Company Records, 1903, at Georgia Power Company, Atlanta, Georgia.

61. Columbus correspondence, Baldwin Papers, 1901-1902.

62. Etta Blanchard Worsley, Columbus on the Chattahoochee, Columbus, Ga. 1951,

63. Industrial Index, 19 March 1924 (special Annual Columbus Number).

64. Baldwin to Flournoy, 31 December 1900.

65. Records of Columbus Railroad Company and Columbus Electric and Power Company, 1922 and 1930, respectively, at Georgia Power Company, Atlanta, Georgia.

Bibliography

Manuscript Sources

George J. Baldwin papers, Columbus files, Southern Historical Collection at the University of North Carolins at Chapel Hill. Baldwin, of Savannah, Georgia, was president of the Columbus Railroad from 1901-1906. His correspondence with the manager reflects the day to day operations and problems of the power house and railroad. This collection is the best source of information on the growth and development of hydropower in Columbus from 1901-1910.

Minutes of meetings of the Directors of the Columbus Railroad Company are held in the records of the Georgia Power Company in Atlanta, Georgia. The records include minutes from meetings between 1883-1903. Early entries are illegible in sections. After 1922 these become records of the Columbus Electric and Power Company.

Columbus Electric Company Records, held in Georgia Power Company's files in Atlanta. This company operated the Cas Light Company of Columbus and the Columbus Railroad Company from 1903-1922. Because the concerns of this holding company were purely financial, the source is good only for business statistics.

City Mills Company Records held at the City Mills Company in Columbus, Georgia contain a great deal of description of relations between the Columbus Railroad and the City Mills people.

Muscogee County Superior Court Records of Writ for the years 1898 and 1909 contain the proceedings of the suits between City Mills and the Columbus Railroad Company. This is a concise source for understanding the conflict between the two companies over water rights.

Printed Sources

Borleau, W. F., "The Electrical Equipment of a Southern City," Electrical World 30 (4 September 1897), 275-278. An excellent detailed, technical description of the power house.